

## Science

### Genre

#### Informational Nonfiction

gives facts about real persons, things, places, situations, and events.



### Text Feature

**Diagrams** and **Labels** are drawings and explanations of how something works.

### Content Vocabulary

**amputated**      **technology**  
**artificial**      **bionics**

# Amazing Artificial Limbs

by Jackie Glassman

**Y**our day is full of activities you probably don't think much about, such as brushing your teeth, eating breakfast, walking to school, and riding your bike. Now imagine how you would accomplish these tasks if you were missing a limb, an arm or a leg.



Some people have lost limbs because of accidents or have had them **amputated** because of a disease. Other people are just born that way.

Throughout history, inventors have been developing **artificial** limbs, known as prostheses. A mechanically-operated arm was invented as early as the 1940s.

Today's modern medical **technology** has led to the development of new materials, advances in computers, and a greater understanding of the body. Many body parts can now be replaced with artificial ones that work almost as well as the originals. The science of designing electronic limbs is called **bionics**. New electronic limbs make it possible for people to control their artificial limbs in highly effective ways. These high-tech devices are improving the lives of many people.



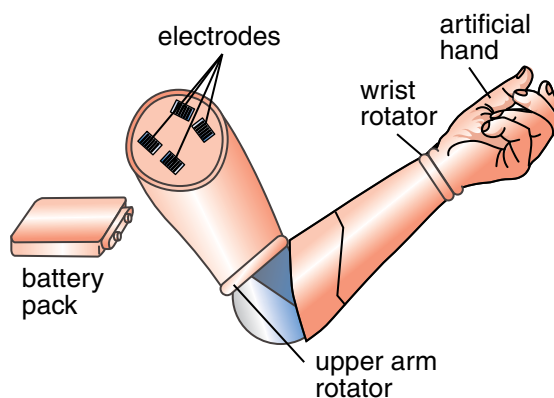
## Diamond Excell and Her Bionic Arms

Diamond Excell had to write, eat, and even brush her teeth with her feet because she was born without shoulders or arms. Then on her eleventh birthday, Diamond received a wonderful gift. She was fitted with myoelectric arms designed by inventor Ivan Yaeger.

## How an Artificial Arm Works

### Reading a Diagram

This diagram shows an artificial arm. Inside are tiny electrical parts, motors, and batteries. Gears and motors inside allow the artificial arm to bend and work.





The natural-looking limbs have tiny electrical parts and motors inside that made it possible for Diamond to hug her mother for the first time. By moving muscles in her back, Diamond creates electrical signals that control motors inside the prostheses. Each arm has motors that open and close the joints. The wrists and the elbows are designed so that when Diamond walks, her arms swing freely and naturally.

Until recently artificial legs were very low-tech. They were mainly controlled by the body's normal walking movements, which required a lot of energy. Today a myoelectric leg, like the myoelectric arm, is controlled by a person's muscles.



However, this is not as easy as it sounds. People with artificial limbs must go through lots of training to learn how to effectively control their replacement limbs. With the help of a myoelectric leg, many people can now participate in sports such as basketball and running.

With ongoing advances in science and technology, society can look forward to huge improvements in artificial limbs. For example, new materials allow prosthetic feet to press and spring much like real feet. One type of artificial foot transmits electronic information about pressure to the person using it. Feeling pressure helps people to balance because they can tell whether their weight is on the toes, heels, or sides of the feet.

## Looking into the Future

In the very near future, scientists hope to create bionic limbs so that Diamond and others will have a first-rate sense of touch, making their artificial limbs that much closer to the real thing.

### Connect and Compare



1. Look at the text and diagram on page 383. How do you think the wrist rotator works? **Reading a Diagram**
2. What improvements do you think can still be made to artificial limbs? **Evaluate**
3. How is Erik Weihenmayer's determination in "Seeing Things His Own Way" like Diamond's? **Reading/Writing Across Texts**



### Science Activity

Research information about a high-tech innovation. Draw a diagram with accurate labels illustrating the innovation.



Find out more about bionics at [www.macmillanmh.com](http://www.macmillanmh.com)



# Interviewing a **WINNER**

## Writer's Craft

### A Strong Conclusion

State your main idea near the beginning. Follow with supporting details that relate to the main idea. End with a **strong conclusion** that connects to the introduction.

## The Reward of Helping Others

by LeShante B.

The first sentence states my main idea about my friend Jarvis.



I included a strong conclusion about Jarvis.

My friend Jarvis may not have trophies or medals, but he feels like a winner when he's helping others.

**LeShante:** What is your proudest accomplishment?

**Jarvis:** Volunteering at the nursing home each week is my proudest accomplishment. I help people feel better.

**LeShante:** What do you do there?

**Jarvis:** I read to people and tell them about myself. They also tell me about themselves. We play games together.

**LeShante:** What do you enjoy doing most?

**Jarvis:** Once a month the volunteers help organize a special Bowling Night in the cafeteria. We form teams and even have prizes. Everyone has a great time. I also enjoy talking to older people because they have a lot of stories. You can learn a lot from them.

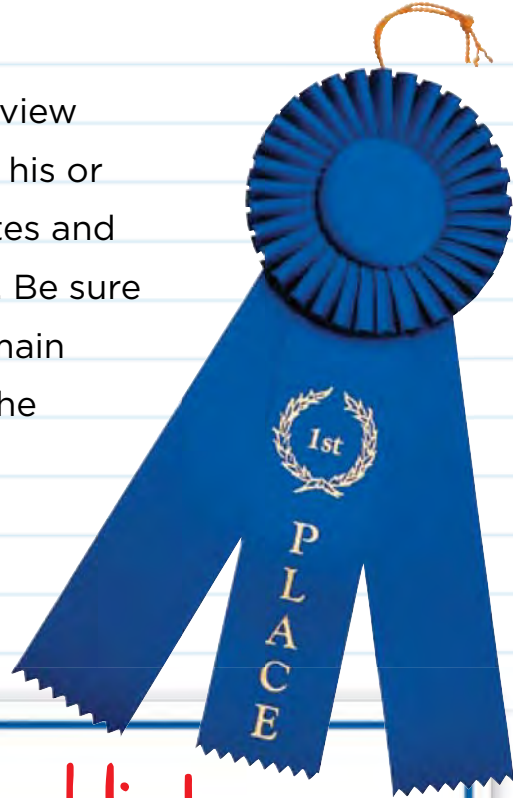
**LeShante:** Why would you encourage others to volunteer?

**Jarvis:** It's a good way to serve the community, and you really gain from volunteering. I've made new friends and they're always happy to see me when I visit. I look forward to it each week.

Don't you agree with me that Jarvis is an outstanding winner?

## Your Turn

Everyone is a winner in some way. Interview a classmate with three questions about his or her proudest accomplishment. Take notes and include his or her answers in your work. Be sure to provide supporting details for your main idea. Include a strong conclusion. Use the Writer's Checklist to check your work.



## Writer's Checklist

- Ideas and Content:** Did I ask questions about my subject's proudest accomplishment? Did I include a **strong conclusion**?
- Organization:** Did I record details that supported my main idea?
- Voice:** Did I include words and phrases that make the writing sound like me?
- Word Choice:** Did I use descriptive words?
- Sentence Fluency:** Did I vary the length of my sentences?
- Conventions:** Did I make sure that all my pronouns agree with their antecedents? Did I check my spelling?